

requirement is the most reasonable approach to satisfying this DOD requirement together with a 15 minute command generation time allowance⁷⁶ which would result in a 120 minute response time.

4. Transitional Interference Statistics

The Commission has requested statistics of the interference created to a DMSP ground station from the time a DMSP satellite would change frequency band segment and the time all the Little LEO satellites could be recommended. This is a multidimensional problem, complicated by the potential world wide DMSP user locations and Little LEO command sites. This analysis appears in Appendix E.

5. Accurate Ephemeris Prediction

Leo One USA recommends that the use of NORAD's Two Line Mean Element Set ("2LMES") be avoided as they provide low orbit prediction accuracy. A state vector or a ranging approach is recommended as the format for obtaining the observables. The element set should use numerical integration to perform both orbit determination and orbit propagation (Cowell's method). The result can be orbit prediction within 100 meters of the actual orbit for a period longer than two weeks. Moreover, there are good orbit determination and propagation COTS tools available today. These tools can and will be utilized to perform Leo One USA's orbit calculations. A detailed analysis of this issue appears in Appendix E.

⁷⁶

Given no warning, and with automated command generation software, it is estimated that it may take 10 to 15 minutes for the command streams to be generated and transmitted to the appropriate remote command stations. The costs of generating and validating this software, while not insignificant, are minor compared to the total network operations software requirements. Likewise, it is anticipated that dedicated leased lines or VSAT networks will be required to link the COCC and the remote command sites. The logistics and cost of a foreign command station should be no worse than that associated with establishing foreign gateways. However, the costs incurred with in-country (network) gateways may not be Leo One USA's expense, but rather that of the local service provider.

D. Sharing Uplinks in the 148 - 149.9 MHz Band

The Commission proposes sharing of the 148.905 - 149.81 MHz band using a dynamic channel assignment method. Specifically, new NVNG MSS operators would share this band with Orbcomm. This proposed sharing method is fully consistent with the record in this proceeding and can technically be implemented.

Orbcomm has taken the position since 1992 that it could share this band with other NVNG MSS users. In the 1992 Negotiated Rulemaking proceeding Orbcomm stated "in the FDMA portion [of the 148 - 149.9 MHz band] dynamic channel assignment techniques would allow other systems in addition to Orbcomm."⁷⁷ In 1993 Orbcomm stated that "sharing [of Dynamic Channel Activity Assignment System] can be accommodated, and would look to a coordination as the appropriate forum for working out the details of such operations."⁷⁸ Based on these representations from Orbcomm, the Commission, in its order adopting service rules for the NVNG MSS, chose not to adopt dbX's [Leo One USA's] suggestion in the NVNG MSS rule making that the pool of channels available to an individual FDMA/TDMA operator for NVNG MSS uplinks be limited to 40 channels.⁷⁹ The Commission indicated that if sharing proved not to be viable it may establish channel limits.⁸⁰ Given this background, there can be little question that new FDMA/TDMA systems can share the 148.905 - 149.81 band with Orbcomm. In light of the infancy of this

⁷⁷ Letter from Albert Halprin dated September 22, 1992.

⁷⁸ Supplemental Reply Comments of Orbcomm dated June 18, 1993.

⁷⁹ See 8 FCC Rcd. at 8455-56 n.38.

⁸⁰ *Id.*

technology and service implementation, a number of systems should be able to share this spectrum for the foreseeable future. As Orbcomm suggested, the licensees should establish through coordination discussions a suitable sharing mechanism to protect the operational integrity of the systems using the band.

E. Sharing With Radio Navigation Satellite Service

NVNG MSS systems can share with the RNSS satellite systems, however, this sharing will impose certain burdens on the NVNG MSS operator. The fact that the U.S. Transit satellite system will have vacated the Transit band by the end of 1996 is of little consequence when considering the significant interference imposed by the RNSS satellite system to Little LEO satellite uplink receivers. Nevertheless, with proper satellite design, the use of good engineering practices and a suitable channel assignment plan it should be possible for an NVNG MSS system to use the 149.9 - 150.05 bands.⁸¹

X. THE COMMISSION SHOULD RELY ON STRICT ENFORCEMENT OF FINANCIAL QUALIFICATIONS, NOT AUCTIONS, TO RESOLVE MUTUAL EXCLUSIVITY

Leo One USA encourages the Commission to rely on strict enforcement of its financial qualification rules to eliminate mutual exclusivity and encourage prompt licensing of competitive NVNG MSS systems. As is discussed in greater detail in Section VII above, Leo One USA supports application of the Domsat financial qualification test to eliminate financially unqualified applicants. Leo One USA believes these rules will permit the FCC to quickly license new, qualified NVNG MSS service providers. Nonetheless, Leo One USA would support use of auctions to resolve this

⁸¹ See Appendix E for a more detailed discussion.

proceeding if the Commission is unable to eliminate mutual exclusivity through strict application of the Domsat test.⁸²

A. Auctions Present Unique Problems for Global Satellite Systems

The Commission correctly concludes that competitive bidding or auctions is particularly problematic for global satellite systems.⁸³ The initiation of auctions in the United States may lead to auctions of NVNG MSS landing rights throughout the world and may trigger auctions of landing rights for all global satellite systems. The advent of worldwide sequential auctions would undercut any applicant's ability to judge the correct market value of the initial auction in the United States and may raise costs for NVNG MSS implementation to the point where additional entry is foreclosed. In addition, auctions in the U.S. may trigger auctions of landing rights for existing first round licensees seeking to enter markets abroad.

Leo One USA is also concerned that the specter of sequential auctions may actually cause significant delays in the introduction of competitive NVNG MSS systems. Unlike the current situation where FCC licensing is the final regulatory hurdle for system implementation, U.S. licensees may be forced to postpone system implementation until completion of sequential auctions in ten or fifteen countries which have the largest potential markets.

The uncertainties created by auctions also increase the probability that capital markets will withhold funding for NVNG MSS systems until worldwide authorizations are obtained. The additional cost of worldwide auctions would put NVNG MSS systems at a competitive disadvantage to the first round licensees and other service providers. Again, this problem would only serve to

⁸² See Appendix A for a more detailed discussion of auctions.

⁸³ Notice at ¶¶ 80-81.

make the NVNG MSS less attractive for investment and to further delay introduction of competitive NVNG MSS systems.

B. Auctions Should Be Used as a Last Resort

Notwithstanding the drawbacks of auctions for NVNG MSS systems, Leo One USA would support the use of auctions if mutual exclusivity remains after application of the Domsat financial qualification test. Although auctions may create delays in NVNG MSS system implementation, regulatory logjam will cause an even more detrimental delay. Leo One USA does not support use of comparative hearings or consortia to resolve mutual exclusivity. In the event no other options are available, the Commission should auction second round NVNG MSS licenses among those judged to be financially qualified to hold NVNG MSS licenses.

C. Comments on the Auction Process

The goal of the auction process is to bring competition and service to the public as soon as possible. Leo One USA encourages the Commission to structure any auction rules for this service around these goals.

1. Bidding on Multiple Systems

Leo One USA encourages the Commission to implement a flexible approach in the event it adopts auction rules. Any attempt to restrict bidders to only one system or to prevent aggregation of systems may ultimately undermine the Commission's efforts to enhance competition.

As Leo One USA has set out in greater detail above,⁸⁴ the Commission's channel allotment plan will not provide adequate competitive enhancements to the NVNG MSS marketplace. Leo One

⁸⁴ See Section V(B) *supra*.

USA urges the Commission to allow bidders to aggregate these systems in order to create a system capable of providing robust competition to the first round licensees and maximizing consumer benefits from competition.⁸⁵

2. Incumbents

First round licensees should be prohibited from participating in any auction of remaining NVNG MSS spectrum. Any other approach will nullify the Commission's attempts to enhance competition for NVNG MSS services. An incumbent has anticompetitive incentives to request spectrum or to bid on spectrum if an auction is held. Orbcomm (and potentially GE Starsys) has an incentive to acquire spectrum to block entry into markets in which it expects to operate or plans to enter eventually. Either or both could find it profitable to bid significant amounts (especially if Orbcomm and GE Starsys act together or split the cost) even if they planned to simply warehouse that capacity. Since total profits of all suppliers would fall with entry, the monopolist (or duopolists) stand to lose more than the entrant will gain, so that a monopolist (or duopolists acting together) will always outbid an entrant. Or, as phrased in the leading graduate industrial organization text:

Because competition destroys industry profits, an incumbent has more incentive to deter entry than an entrant has to enter.⁸⁶

This is particularly true in this situation because, since marginal costs are very low, entry could be very expensive to the incumbent(s). Thus, an unrestricted auction could be expected to result in maintenance of the current, noncompetitive market structure, and a waste of the spectrum.

⁸⁵ See Appendix A.

⁸⁶ Jean Tirole, *The Theory of Industrial Organization* at 350, (The MIT Press 1988).

The Commission should not assume that the government's revenues from any auction of the relevant spectrum would be lower if incumbent Little LEO licensees were not allowed to bid, since adding incumbents to the auction will not necessarily increase the number of bidders. Auction participation requires potential bidders to place at risk a significant investment. These expenditures include the costs of research to estimate demand; the costs of reaching vendor partnering agreements; the costs of establishing detailed build-out plans (since the value of the license is affected by the capital and operating costs of the system to be built); the costs of raising capital from a variety of sources, many of them geographically specific to the market being bid on; and the cost of the legal and economic analysis necessary to receive regulatory approval.

Companies will not incur such up-front costs to participate in an effort that they are certain to lose, nor can they obtain sources of venture capital for such efforts. Thus, if other participants believe that the incumbent monopolist will prevail in bidding (which is just what the preemption theory says will happen if everyone has full information), then alternative bidders will not bid. This is especially true in an English auction such as the FCC would be likely to run. In such an auction, each bidder can submit a sequence of bids and knows what the prevailing high bid is at all times. There is no chance the monopolist will make a mistake and accidentally be outbid by somebody else.⁸⁷ Thus, auction revenues could fall if a single incumbent with market power were allowed to bid. All competitive bidders have strong incentives not to spend the money necessary to prepare a bid, knowing ultimately they will be outbid by someone who (because of market power) values the license more highly. The price of spectrum will be determined, in part, by the number of bidders.

⁸⁷

This possibility would exist in a sealed bid auction.

Adding incumbent Little LEO licensees as bidders will not increase the total number of bidders if other participants drop out. Leo One USA also does not believe that the use of construction milestones or other mechanisms to prevent the long-term warehousing of spectrum will provide a sufficient incentive to discourage anticompetitive behavior in the auction process. Leo One USA encourages the Commission to exclude existing licensees from any auction as the only means to ensure new entry and to enhance competition for NVNG MSS services.

3. Collusion

The Commission in the past has prevented potential bidders from discussing an auction once the public notice announcing the auction is released by the Commission. In light of the important public policy issues raised by an auction for global satellite systems, Leo One USA suggests that the Commission permit settlement discussions for the purposes of resolving mutual exclusivity among the applicants up to 48 hours prior to the date and time designated for the auction.

D. Construction Milestones And Associated Reporting Requirements Should be Maintained

Regardless of the method the Commission adopts to resolve mutual exclusivity for second round applicants, Leo One USA encourages the Commission to strictly apply construction milestones and associated reporting requirements to *all* NVNG MSS licensees. This means if a licensee has not promptly demonstrated compliance with the milestones, that the license should be declared null and void. Leo One USA has mentioned in these comments the Commission's history of using financial qualification requirements to avoid licensing entities that will ultimately be unable

to finance their systems.⁸⁸ Equally important, however, is the Commission's use of construction milestones to ensure systems are implemented and that unused spectrum is released for licensing to other entities.

The Commission already has recognized the importance of construction milestones for the NVNG MSS. In its order adopting service rules, the Commission stated, "We do indeed intend to continue our longstanding policy of equitably imposing, and enforcing, milestone commitments."⁸⁹ Prompt Commission action to enforce its milestones in other services has freed spectrum for more qualified service providers.⁹⁰ For a service such as this with extremely limited spectrum availability and a finite number of available licenses, strict enforcement of construction milestones is especially critical.

XI. THE COMMISSION SHOULD NOT IMPOSE A POSITION LOCATION REQUIREMENT ON THE NVNG MSS

The Notice seeks comment on effective methods of preventing NVNG MSS transmissions in countries which have not authorized the service. It specifically requests comment on whether a position determination capability should be imposed on the NVNG MSS. Leo One USA agrees the United States has a responsibility to study this issue. Nevertheless, it believes that the imposition of such a requirement on the NVNG MSS would present significant economic difficulties and would set a bad precedent. The imposition of positioning determination requirements on subscriber terminals imposes an unfair economic burden on the user of the terminal equipment. It also adds

⁸⁸ See Section VII *supra*.

⁸⁹ 8 FCC Rcd. at 8455.

⁹⁰ See e.g., *Norris Satellite Communications, Inc.*, DA 96-363, *Order*, (March 14, 1996) (declaring Ka-band authorization null and void).

additional technical complexity to the equipment as well as potentially requiring additional RF spectrum.

Leo One USA believes that the user should be responsible for abiding by the regulations of each country. The analogy is a user bringing into another country a public service or cellular radio, and operating or attempting to operate the unit without authority. Traditionally it is the *user* of the equipment that bears the burden of operating the equipment in a manner consistent with local law. There is no reason to change this obligation for the NVNG MSS given the burdens it would create.

Adding a Global Positioning System ("GPS") Original Equipment Manufactured ("OEM") module to a subscriber terminal is expected to add at least \$50 - \$100⁹¹ per terminal. The terminal would also need a GPS antenna, similar to the small patch antennas used in the PCMCIA card GPS receiver products. The addition of such a capability adds to the subscriber terminal bulk and power requirements, adding to its disadvantage for portable users and intermittent usage device oriented markets. For Little LEO services to be economically viable, they must rely on very low-cost terminals and service. Although a GPS requirement could prevent unauthorized transmission, it would impose significant cost and terminal size restrictions on the service provider.⁹²

Leo One USA strongly believes that if the Commission decides to impose this requirement (or other requirements) on the NVNG MSS, it must be applied to all licensees, not just the second

⁹¹ The \$50 figure represents receivers which require that the position location be processed at a central location rather than by the actual receiver unit. This results in additional data transmissions and reduced system capacity. \$100 receivers have the capability of internal processing. However, the user must bear the burden of more expensive ground equipment. Thus, the position location requirement would result in either greater expenses or system inefficiencies.

⁹² It should be noted that GPS will not work well in buildings and acquisition could take up to 66 minutes depending if an almanac is available.

round licensees. Otherwise, the Commission would provide a significant competitive advantage to those licensees not subject to the requirement. It would also be inconsistent for the Commission to say that the requirement was necessary but at the same time exclude some licensees from complying with the rule.

Some Little LEO service providers, such as Orbcomm, plan on providing Doppler location estimation services for some class of terminals. Most terminals are not likely to be moving at high speeds. Therefore, position location using Doppler should be relatively accurate. Leo One USA does not believe that this would be an appropriate requirement to prevent illegal operators for a number of reasons. First, short term measurements to mobile subscriber terminals, GPS or Doppler, do not provide highly accurate position location estimates (both because of terminal motion and because of the short observation interval available). Second, the subscriber terminal oscillator frequency accuracy could significantly lengthen delay in position determination and thus cause delay in message delivery. Terminal frequency reference error causes a shift in the received Doppler profile just as does a drift in the satellite reference. For a short term measurement, any frequency error term would translate nearly directly into location error. If a terminal can observe a complete satellite pass, it can use the knowledge that the Doppler profile should be symmetric about the point of closest approach to correct for the terminal frequency reference error. This means that it may be approximately 5 to 15 minutes before a solution could be obtained. This is likely to be an intolerable delay for many users who urgently wish to send or receive a message. This delay could be longer if only one satellite is visible. In this case there would be no way for a terminal to resolve by Doppler alone if it is to the east or west (north or south) of the satellite orbit ground track without additional information or an *a priori* estimate of location. That is, the Doppler profiles would be

identical. This limits the usefulness of Doppler geo-location for small constellation systems or early deployments of larger constellations. This may mean that Doppler measurement, using a single satellite observation, could not resolve the ambiguity between the UK and The Netherlands, for instance. Given these constraints, Leo One USA suggests that nothing more than a notice to customers to comply with local law should be required of NVNG MSS operators.

XII. THE COMMISSION SHOULD ADOPT RULES BARRING EXCLUSIVE ARRANGEMENTS

During the last several years, the United States has undertaken an aggressive policy to open up to competition the international telecommunications marketplace. Given the global nature of NVNG MSS systems, an operator could use the international licensing process to limit a competitor's economic viability. Consistent with existing U.S. policies on competition in international telecommunications, the Commission should not condone such behavior. It should therefore adopt a policy prohibiting exclusive agreements that foreclose competing Little LEO licensees from serving a foreign market.

XIII. THE COMMISSION SHOULD EXPEDITE PROCESSING OF PENDING APPLICATIONS

Leo One USA strongly urges the Commission to expedite processing of the pending, eligible NVNG MSS second round applications. There is an urgent demand for the telecommunications services to be provided by the NVNG MSS, and prompt Commission action to license second round systems will foster competition and innovation in this industry. The second round applications have been pending for several years. Since the applications were filed, some of the second round applicants have invested significant resources in developing new and innovative NVNG MSS systems that will enable new services to be provided to the public. Completion of this rulemaking

proceeding in the upcoming weeks should allow the Commission to promptly license second round systems and fulfill the goals underlining this rulemaking.

XIV. CONCLUSION

For the foregoing reasons, Leo One USA Corporation requests that the Commission accept the comments contained herein.

Respectfully submitted,

/s/ Robert A. Mazer

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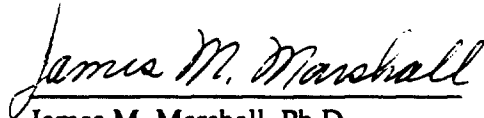
Dated: December 20, 1996

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Counsel for Leo One USA
Corporation

Engineer's Certification

I hereby certify that I am the technically qualified person responsible for preparation of the engineering information contained in these Comments, that I am familiar with Part 25 of the Commission's Rules and that I have either prepared or reviewed the engineering information submitted in these Comments, and that it is complete and accurate to the best of my knowledge.

A handwritten signature in cursive script that reads "James M. Marshall". The signature is written in dark ink and is positioned above the printed name and address.

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Dated: December 18, 1996

APPENDIX A

APPENDIX A

AFFIDAVIT OF FREDERICK R. WARREN-BOULTON

I. QUALIFICATIONS

My name is Frederick R. Warren-Boulton. My business address is MicRA, Suite 900, 1155 Connecticut Avenue, NW, Washington, D.C. 20036. I am currently a Principal and Director of Microeconomic Consulting and Research Associates, Inc., a Washington-based economics consulting and research firm specializing in antitrust and regulatory matters. I hold a B.A. degree from Yale University, a Master of Public Affairs from the Woodrow Wilson School of Public and International Affairs at Princeton University, and M.A. and Ph.D. degrees in Economics from Princeton University. From 1972 to 1983, I was an Assistant and then Associate Professor of Economics at Washington University in St. Louis.

From 1983 to 1989, I served as the chief economist for the Antitrust Division of the U.S. Department of Justice, first as Director of its Economic Policy Office and then as Deputy Assistant Attorney General for Economic Analysis. At the Division, I supervised the economic analysis of all merger, price-fixing and monopolization cases, Division filings before the Federal Communication Commission and other state and federal regulatory agencies, and legislative and other general policy issues relating to antitrust and regulation.

Since leaving the Department of Justice, I have served as a Resident Scholar at the American Enterprise Institute, a Visiting Lecturer of Public and International Affairs at the Woodrow Wilson School at Princeton University, and Research Professor of Psychology at The American University.

My area of specialization is in the economics of industrial organization. My publications are primarily in the application of industrial organization economics to antitrust and regulation, including a number of papers that consider appropriate public policy toward regulated industries, including telecommunications. A complete description of my background and papers can be found in my Curriculum Vita, a copy of which is attached to this testimony.

II. INTRODUCTION: SUMMARY AND CONCLUSIONS

I have been asked by Leo One USA Corporation ("Leo One USA") to analyze and evaluate the effects on competition and on consumer welfare of the Commission's proposal to award licenses only to new entrants in the second Non-Voice, Non-Geostationary Mobile Satellite Service ("NVNG MSS") Little LEO processing round. In the analysis that follows, I use the structure-conduct performance paradigm, as implemented in the *Department of Justice and Federal Trade Commission Horizontal Merger Guidelines* (discussed in Section III) to define the relevant product and geographic markets (Section IV), identify the firms that participate or could participate in those markets (Section V), calculate the market shares and levels of concentration in those markets under alternative licensing policies by the Commission (Section VI) and estimate the effect of that entry and changes in concentration on prices and on the welfare of consumers (Section VII). I then proceed to examine the anticompetitive incentives of an incumbent to request spectrum or to bid on spectrum if an auction is held (Section VIII), discuss the problematic aspects of an auction in this case (Section IX), the need for spectrum to be efficiently reorganized before being assigned to new entrants (Section X), and conclude with a discussion of essential post-allocation restrictions on the resale or transfer of auctioned or allocated spectrum (Section XI).

The central conclusion that emerges from the first part of this analysis (Sections III - VII) is that the case for encouraging entry into this market, and thus for restricting the award of licenses in this round to new entrants, is a compelling one. Entry would not, as might seem at first glance, simply increase the number of equivalent suppliers from three to four in a single overall market. Instead, a more detailed analysis reveals both that the spectrum capacity to be awarded can be utilized in a very large number of distinct product markets and that current license holders differ greatly in terms of capacity, likelihood of survival and goals. As a result, a new Little LEO supplier which is able to offer near-real time service would be expected to use its capacity both to provide a new service in a large number of markets that cannot be served by first round licensees and to increase competition significantly (generally equivalent in effect to a movement from monopoly to duopoly) in many others. The result would be large gains to consumers that would be foregone if spectrum sufficient to allow efficient-scale entry were not allocated to a new entrant or, equivalently, if the incumbent suppliers were allowed to bid on the remaining available NVNG MSS spectrum.

While factual determinations at this early stage in the life of this industry are necessarily subjective, we can identify some 236 distinct markets or market segments that are potentially markets as defined by the *Merger Guidelines* and which could be served by a second round licensee if it receives the necessary spectrum from the FCC.

Of these 236 markets, 80 cannot be served by any first round Little Leo system.¹ These 80 markets are characterized by a high valuation on timeliness of transmission and broad (global or nationwide) geographic coverage. The only alternative non-Little LEO potential supplier in these

¹ Although Orbcomm and GE Starsys may have access today to sufficient spectrum to implement near-real time systems, the current technical design and system implementation plans of these two satellite systems do prevent the offering of near-real time services.

markets would be a Big LEO System with costs significantly higher than those of Leo One USA. In these markets, a system similar to that proposed by Leo One USA will either be providing an entirely new service or will enable a large reduction in price (and/or increase in quality) to consumers. It is in these markets that the gain to consumers will be the most certain (and perhaps account for the largest increase in consumer surplus) and, since these will also be the most profitable markets to enter, it is to these markets that Leo One USA can be expected to first allocate its available capacity.

In another 44 markets, one or more incumbent Little LEO systems would be the low-cost provider(s). In these "other Little LEO markets," the entry of Leo One USA would result in a significant decrease in concentration and could be expected to lead to significant price decreases and thus benefits to consumers. Estimates of the amount of the gain to consumers in these markets would depend on the oligopoly model assumed and on the size of the decrease in concentration, which in turn is highly sensitive to the various licensing alternatives under consideration by or proposed to the FCC. Even assuming the most optimistic set of circumstances, that the GE Starsys system will be viable and that VITA competes with the for-profit systems, these markets would already be highly concentrated under today's environment, with an HHI (the Herfindahl-Hirschman Index² calculated from capacity-based shares of at least 6239. If the new capacity were assigned to

² The HHI is the most commonly used concentration measure in the economics literature, and it is the measure used in the *Department of Justice and Federal Trade Commission Horizontal Merger Guidelines, April 2, 1992*, hereafter referred to as the *Guidelines*. The HHI is calculated by summing the squares of the individual market shares of all the participants. The HHI is thus larger, the smaller the number of firms in the market and the more uneven the distribution of their market shares. Thus, a monopoly market would have an HHI equal to 10,000; a market with two firms, one with a 60% market share and the other with a 40% market share would have a HHI equal to 5200; a market with five equal-sized firms would have an HHI of 2,000, etc.

first round licensees (or, equivalently, if first round licensees were allowed to compete in an auction) the HHI in these markets would rise to at least 6558 (an increase of 5%). In contrast, if two additional licenses for efficiently configured and sized spectrum are assigned to new entrants, as proposed by Leo One USA, the HHI would fall significantly, to at least 2784 (a decrease of 55%). Under another set of assumptions (*i.e.*, VITA operates in a specialized not-for-profit market, and GE Starsys fails to launch its system) the HHI in these markets will remain at 10,000 if the remaining Little Leo spectrum were assigned to ORBCOMM (or, equivalently, if ORBCOMM were allowed to compete in an auction³), and would fall to 3340 (a decline of 67%) if, as proposed by Leo One USA, two additional licenses for efficiently configured and sized spectrum are assigned to new entrants. While the effects of changes in concentration on prices depends on a number of factors, the significance of these changes in the HHI can be seen by observing that, under the most widely used oligopoly model in industrial organization (the Cournot model), percentage price changes could, because of the very high share of fixed costs in this industry, be close to the percentage change in the HHI.

In the remaining 112 markets identified, Little LEO systems would be likely to face varying degrees of competition from multiple suppliers of several types of other systems, notably cellular, broadband PCS and SMR, as well as terrestrial data system suppliers such as Cellnet and CDPD. In these markets, new entrants can be expected to look for "niche" sales, where some characteristic of a Little LEO service appeals to customers with particular attributes. Entry of second round licensees into these markets can thus be generally expected to be the lowest priority for Leo One

³ As discussed below in Section VIII, Orbcomm would have anticompetitive motivations for pre-emption and warehousing if it were allowed to bid in an auction for the available "Little LEO" spectrum.

USA's use of available capacity, as well as affecting prices the least and generating the lowest benefit to consumers.

Given that Leo One USA can be expected to allocate system capacity to its most profitable use, it is not surprising that Leo One USA revenues are expected to come disproportionately from new-service and Little LEO markets. New-service markets account for 32% of the number of markets but are expected to generate 60% of revenue. Other Little LEO markets account for 17% of the number of markets, but are expected to generate 26% of revenues. And "niche" sales within competitive markets, which account for 44% of the number of potential markets, are expected to account for only 14% of Leo One USA's revenues.

These data, when combined with some simple but not unrealistic -- even conservative -- assumptions, are sufficient for us to derive a rough, "back of the envelope" estimate of the gain to consumers (the increase in consumer surplus) that would result from the entry of Leo One's proposed System A and System B. For example, assuming linear demand curves in all markets; all costs fixed (*i.e.*, zero marginal cost); Cournot-type behavior in oligopoly markets; VITA competing in for-profit markets and GE Starsys successfully launching its system; the entry of Leo One USA and a second new entrant; only one new entrant entering into "new service" markets; and no effect at all on prices in "competitive-niche" markets from the System A or the System B supplier's entry into those markets, the estimated increase in consumer surplus in year- five from new entry would be 50% of Leo One USA's anticipated year-five revenue of \$ 295 million from new service markets and approximately 236% of Leo One USA's year-five anticipated revenue of \$126 million from "Other Little LEO" markets, plus 0% of Leo One USA's anticipated revenue of \$ 67 million from "competitive-niche" markets, for a total increase in consumer surplus of \$ 444 million, or 91% of

Leo One USA's anticipated total revenue. Thus, on average, for every dollar in revenue that Leo One USA receives, almost another dollar will be passed on to consumers in increased consumer surplus through lower prices.

III. METHODOLOGY

The Notice proposes that the structure-conduct-performance (SCP) paradigm of modern industrial organization be used to analyze how market performance would be affected by an increase in the number of Little LEO systems. The main application of the SCP paradigm in public policy has been, of course, to antitrust policy and, especially, in the analysis and evaluation of mergers. The Federal Trade Commission and the Antitrust Division of the Department of Justice, as the agencies responsible for enforcing the antitrust laws and for encouraging competitive policies at regulatory agencies, have developed an analytical framework for applying the SCP framework in practice. That framework, which reflects both the large body of analytical work done within the agencies and in academia as well as the considerable experience of those agencies with mergers and other competitive issues, has been embodied in successive versions of the *DOJ/FTC Horizontal Merger Guidelines*.⁴ The *Guidelines* provides a general analytical framework that can be used to evaluate a broad range of events or policies that can affect competition (e.g., mergers, anticompetitive practices or, as in this case, the effect of alternative licensing procedures on competition and consumers). In what follows, therefore, I shall apply the *Guidelines* framework and methodology to the relevant issues on which the Notice requests comment, including demand considerations (i.e., market definition), supply considerations (i.e., identification of the participants

⁴ The most recent is the *Department of Justice and Federal Trade Commission Horizontal Merger Guidelines*, April 2, 1992, hereafter referred to as the *Guidelines*.

in that market, quantifying their market share and competitive significance), the relationship between structure, conduct and performance (i.e., evaluating the effect of entry and the resulting change in market structure on the level of competition in the market and the potential for collusion, and hence on prices and consumer welfare).

IV. DEFINING THE RELEVANT MARKETS

The first step in determining the effect of any policy toward market structure is to define the relevant market or markets. Market definition focuses solely on demand substitution factors, i.e. possible consumer responses, while supply substitution factors, i.e. possible production responses, enter into the analysis in the identification of firms that participate in the relevant market and the analysis of entry. The *Guidelines* formally defines a market as:

a product or group of products and a geographic area in which it is produced or sold such that a hypothetical profit-maximizing firm, not subject to price regulation, that was the only present and future producer or seller of those products in that area likely would impose at least a “small but significant and non-transitory” increase in price [above the competitive level], assuming the terms of sale of all other products are held constant. A relevant market is a group of products and a geographic area that is no bigger than necessary to satisfy this test.[*Guidelines*, p.7]

The row entries in *Table 1: Markets and Suppliers* (attached at the end of this document) presents Leo One USA management’s breakdown of the broad market for commercial radio location and two way data messaging (CRL-TWDM) services into markets as defined by the *Merger Guidelines*. Leo One breaks the marketplace into 5 general service categories; Tracking, Monitoring, Messaging, Emergency Services, and Transaction Services. Within each service category we identify various categories of applications. For example, Tracking incorporates 5 categories of applications.

- Truck Dispatch and Monitoring
- Maritime - Commercial Shipping
- Maritime Recreational
- Tracking - Standard Containers
- Tracking - Refrigerated & Hazardous Material Containers

Within each application category is a further geographical segmentation that incorporates customer requirements for coverage. In the case of Tracking we can define 4 discrete requirements for service coverage. In other words, some customer applications for Tracking can be fully served by a network that provides coverage in a single Urban area of interest, such as a local dispatch service. Other applications such as the international distribution of goods through NAFTA countries requires the coverage capability of a Global network. For the case example of “Tracking: Truck dispatch and monitoring” we can define the following coverage discriminators:

- Global
- Nationwide: Ubiquitous
- Nationwide: non-Ubiquitous
- Urban/Pockets of Coverage

Within each coverage discriminator we can identify a further market segmentation based on those customers' requirements for timeliness of transmission. In the case example under discussion⁵ we break the markets into the following:⁶

- Outages in coverage of < 5 minutes (including near-real time)
- Outages in coverage of > 5 minutes and < 30 minutes
- Outages in coverage of > 30 minutes and < 3 hr.

Paraphrasing the *Guidelines* language quoted above, and using one of the first of these markets (the fourth from the top in Table 1) as an example, near-real time (or outages less than five minutes) nationwide ubiquitous truck dispatch and monitoring services is a relevant market because a hypothetical monopolist (either a Little LEO or another satellite or even ground-based system) that was the only present and future supplier of a near real time service with nationwide: ubiquitous coverage could raise the price of such services by at least a small but significant amount (*e.g.*, 5-10%⁷) above the competitive level without having so many consumers of that service shift to other

⁵ Customers differ in their sensitivity to timeliness. The time periods in Table 1 thus reflect the best available estimate of the "break point" between markets. For example, for "Tracking--Refrigerated and hazardous material containers", that break point for timeliness of transmission is estimated at about 2 minutes.

⁶ In Table 1, once a provider is deemed to be technically capable of addressing a timeliness requirement, those categories of timeliness that fall below the most demanding are also by definition addressable and have indicated as such with an "*".

⁷ The Antitrust Division interprets a "small but significant non-transitory" increase in merger cases as at least 5%. Mergers, however, are evaluated in existing markets with incumbent suppliers, where extensive information from informed participants and past history can be used to evaluate the ability of consumers to substitute away from a monopolistic price increase. For Little LEOs, however, where many services are prospective or in their infancy, a test using a larger hypothetical price increase that would produce a smaller number of separate markets would seem more appropriate.